

Chapter 4

Framework for Protecting and Managing Wetlands Using Best Available Science

4.1 Introduction

This chapter outlines a four-step framework for developing and implementing approaches to wetland management and protection by local governments. The framework is an adaptation of one developed for the “Statewide Strategy to Recover Salmon” (Washington State Joint Natural Resources Cabinet 1999). It provides the structure on which the concept of “adaptive management” is based. The framework incorporates the findings of the synthesis of the science from Volume 1, such as using landscape analysis, to guide the decision-making process when developing plans, policies, codes, ordinances, and non-regulatory approaches.

The review of the literature in Volume 1 (Chapter 2) emphasizes that wetlands are an integral part of the landscape. To protect and manage wetlands and their functions, local governments therefore need to understand how changes in landscape processes resulting from human activities at the larger scale can affect wetlands at the smaller, site scale. Once such an understanding is developed, it is possible to plan for, and minimize, the impacts of human activities at all geographic scales, and thereby effectively protect wetlands and their functions.

This chapter introduces the four steps of this framework. Following chapters describe each step in more detail. Examples and additional information are provided in appendices.

Analyzing the landscape that influences wetlands is a relatively new idea. Planners and managers of natural resources face a challenge in incorporating landscape information into the planning and protection process. Three common questions posed by planners and managers are:

- What are landscape processes and what do we know about them and their interaction with wetlands?
- What tools can be used to most effectively incorporate a “landscape perspective” into wetland management?
- How do we organize planning and protection activities to incorporate information about the landscape as well as protecting individual wetlands?

The first question is answered in Chapter 5, which describes landscape analysis. The four-step framework described in this chapter, and the guidance that follows in subsequent chapters and appendices in this document, attempts to answer the last two questions.

The following key terms are used to describe processes and functions in Volume 2:

Landscape processes – Environmental factors that occur at larger geographic scales such as basins, subbasins, and watersheds. Processes are dynamic and usually represent the movement of a basic environmental characteristic such as water, sediment, nutrients and chemicals, energy, or animals and plants. The interaction of landscape processes with the physical environment creates specific geographic locations where groundwater is recharged, flood waters are stored, stream water is oxygenated, pollutants are removed, and wetlands are created.

Wetland functions – The physical, biological, chemical, and geologic interactions among different components of the ecosystem that occur with a wetland. Wetlands perform many valuable functions and these can be grouped into three categories: functions that improve water quality, functions that change the water regime in a watershed such as flood storage, and functions that provide habitat for plants and animals.

4.2 Four-Step Framework for Management and Protection of Wetlands

The framework for management is designed to provide a number of opportunities to incorporate landscape information into decision-making at the planning stages as well as into decisions regarding individual wetlands. The four steps of the framework include:

1. Analyzing landscape processes that influence wetland resources (called “landscape analysis”), as well as processes that occur at the scale of the site itself,
2. Prescribing solutions for protecting and managing wetlands based on landscape analysis information (developing policies, plans, codes, ordinances, and non-regulatory approaches),
3. Taking actions to implement the solutions (such as applying regulations at individual wetlands, restoring wetlands, providing non-regulatory incentives), and
4. Monitoring the results of the actions taken and the effectiveness of the solutions (such as tracking acreage and functions of wetlands lost and gained, whether plans and programs are being implemented).

If the data collected through monitoring indicate that wetlands are not being adequately protected, then the management actions need to be revised accordingly. Evaluation of the

monitoring data initiates a feedback loop called adaptive management. Thus, the four-step framework is iterative and ongoing.

Figure 4-1 conceptually illustrates the four-step framework that can be used by local governments to develop and implement effective approaches to protecting wetlands and other critical areas. The first two steps—analyzing the landscape and its wetlands and prescribing solutions—can be considered long-term planning, and the second two—taking actions and monitoring results—as implementation. As mentioned previously, an additional component is a feedback loop called “adaptive management.” It is the process of assessing what has or has not been effective and making modifications based on these insights.

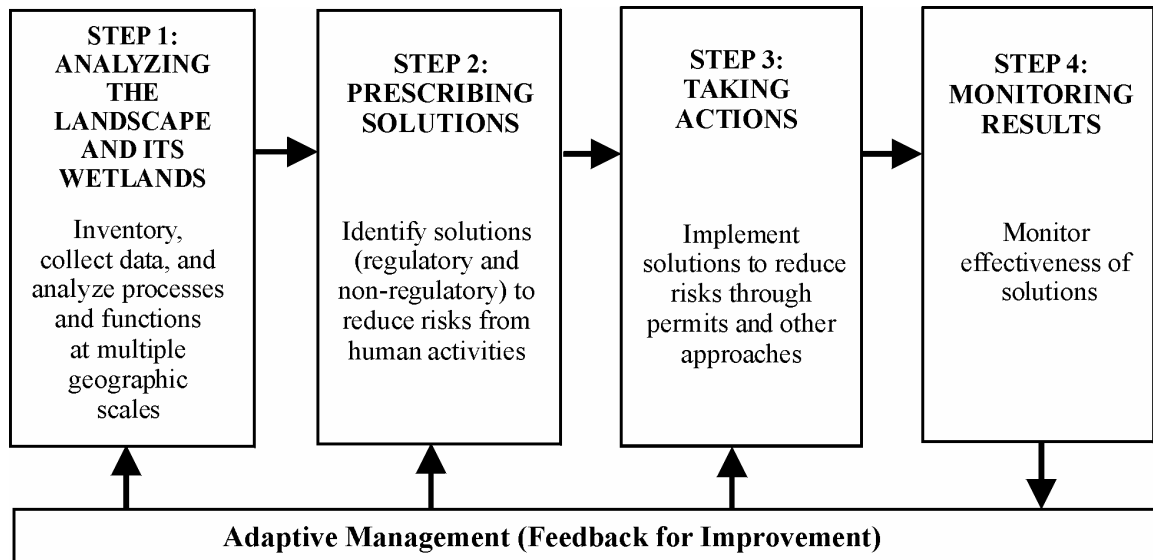


Figure 4-1. A suggested framework for local governments to use in protecting and managing wetlands. These four steps serve as the framework for discussions in this volume.

4.2.1 Incorporating Different Geographic Scales in the Four-Step Framework

The synthesis of the science presented in Volume 1, and the ecological principles listed Chapter 1, indicates the need for analyzing, planning, and managing at a landscape scale as well as protecting resources at the scale of individual sites. Therefore, the words used to describe different scales must be clarified to provide a “common language.”

Local governments can manage and protect wetlands at different geographic scales. Three geographic scales are discussed this document. These are the **contributing landscape, the management area, and the site**. Figure 4-2 provides a conceptual example of these three geographic scales.

The **contributing landscape** is the geographic area within which the landscape processes occur that influence the functions or structure of wetlands located in a *management area*

(defined below). A contributing landscape may span jurisdictional boundaries and even span several watersheds (see Figure 4-2). Given that the contributing landscape may cross jurisdictional boundaries, efforts to protect the wetland ecosystem need to be coordinated and integrated with programs of other local governments. Because most ecosystems are linked across the landscape, it is important that measures to protect wetlands are coordinated with those for protecting other resources including riparian areas, floodplains, estuaries, shorelines, and fish and wildlife habitat.

The **management area** is the geographic area for which plans and regulations are being developed by a local government. The management area is usually a subset of the contributing landscape because it can be based on political boundaries (e.g., a jurisdiction such as a city), or it may be defined geographically to include a specific basin, subbasin, or WRIA (Water Resource Inventory Area) in a county.

The **site** is the area encompassed within the boundary of a single wetland. It too may span private property lines or jurisdictional boundaries.

In Figure 4-3, each of the four steps of the framework described earlier is divided into a series of actions that would be undertaken at each of these three geographic scales.

Steps 1 through 4 of the framework are described in detail following the figures.

Figure 4-2. An example of contributing landscape, management area, and site scales.

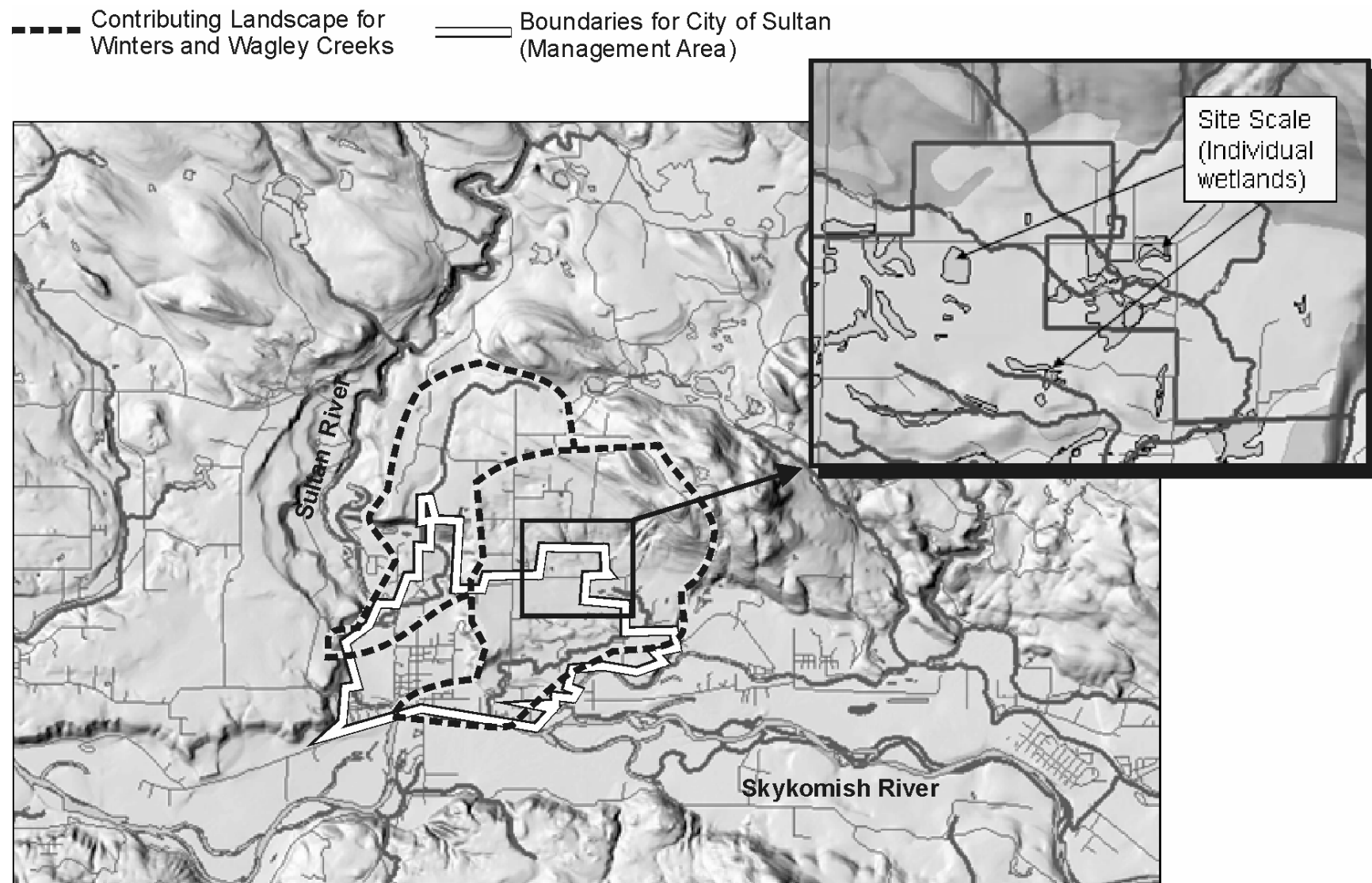
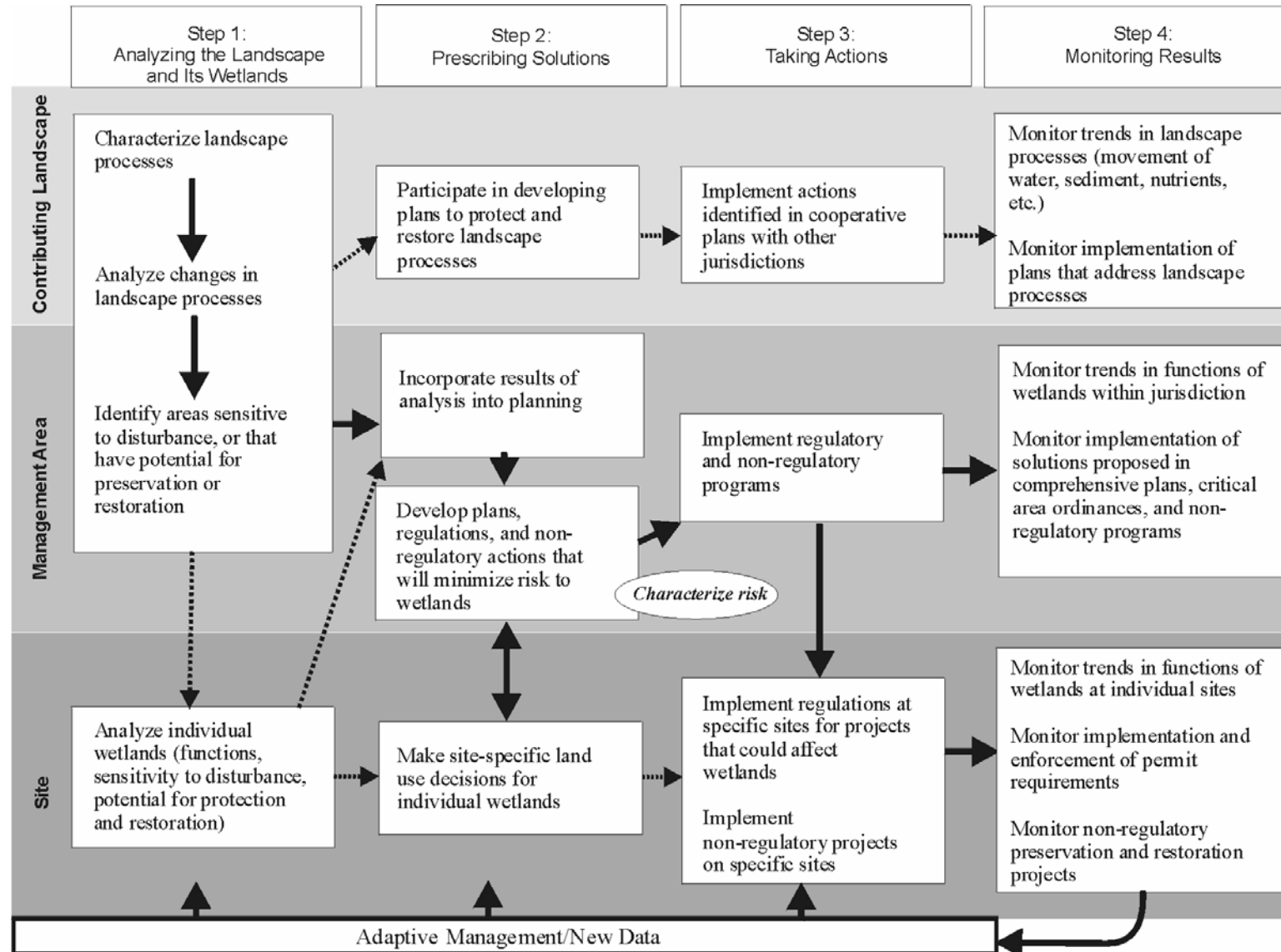


Figure 4-3. Four-step framework incorporating the three geographic scales. Solid arrows represent the process that should be undertaken in developing comprehensive plans and critical areas ordinances. Dashed arrows show additional pathways that can be followed to enhance a wetlands protection and management program.



4.2.2 Step 1: Analyzing the Landscape and Its Wetlands (Landscape Analysis)

Step 1 involves a *landscape analysis*, which is the first step necessary to understand how landscape processes influence wetlands, and to incorporate this information in decisions about land use and its effects on wetlands. As will be discussed in Chapter 5, a landscape analysis is more complex than what is typically required for a wetland inventory, though the two share some similarities. A landscape analysis is needed to interpret and understand the analysis of the functions for individual wetlands.

To facilitate the landscape analysis, Ecology recommends producing annotated maps that identify areas of critical concern for managing wetlands and their contributing landscape. A series of annotated maps can summarize complex geographic information and provide a scientific basis for establishing land use designations and making other decisions about land use. The information can be used in evaluating the relative impacts for a range of alternative scenarios of future development that are created in Step 2.

The paragraphs below briefly describe Step 1 at the various geographic scales shown in Figure 4-2. The process for the landscape analysis is described in detail in Chapter 5.

Analysis of the Contributing Landscape and the Management Area

The analyses of the contributing landscape and the management area are similar. The difference in the analyses for these two geographic scales is more an issue of resolution than a different approach. If the management area is smaller than the contributing landscape, the analysis of the management area can make use of more detailed information. Local jurisdictions can then develop more detailed plans and be provided a better assurance that the risks to their wetlands are minimized. The same tools and methods, however, can be used at either geographic scale.

The purpose of the analysis is to develop an understanding of landscape processes that can affect wetland functions. This includes understanding the movement of water, nutrients, sediments, and toxic compounds, and how wetlands that function as habitat are affected by fragmentation of the landscape. It involves inventorying wetland resources, identifying where critical landscape processes occur, and determining how those critical processes have been modified by human activities. From this understanding one can then determine how these landscape processes may have been changed in the past and how they might change with future development.

There are two main goals of the landscape analysis. The first goal is to identify locations within the contributing landscape and the management area where landscape processes could be negatively influenced by human land uses (e.g., paving areas that provide groundwater recharge). These areas can be considered sensitive and in need of specialized management approaches when planning future changes in land use. These areas may not necessarily include only wetlands, but may encompass important upland

areas such as aquifer recharge areas or upland habitat corridors that connect wetlands across the landscape.

The second goal is to identify areas where landscape processes have been degraded but could be repaired, such as through wetland restoration. Planning for restoration could help offset unavoidable impacts identified through the planning process.

This information is used during Step 2 (Prescribing Solutions) and Step 3 (Taking Actions).

Analyzing Wetlands at the Site Scale

The main goal of the analysis at the site scale is to understand the functions of an individual wetland and how that wetland interacts with the landscape. This analysis can occur at two different times in the planning and regulatory process: during comprehensive planning, and during review of permits for individual projects.

If a local jurisdiction's program to manage and protect wetlands involves preservation or restoration, then individual wetlands will need to be analyzed during the planning process (Step 2). The planning process will identify those wetlands most suited for preservation or restoration.

The functions of individual wetlands are also analyzed during permitting when a proposed activity will alter a wetland. It is important for local governments to establish what will be required for site-specific analysis of wetlands during Step 2, when administrative rules, guidance, or regulations are developed. For example, the requirements should state what must be included within wetland reports and compensatory mitigation plans. The local jurisdiction should also consider methods for assessing wetland functions and for establishing ratings, buffers, and mitigation ratios. Site-specific analysis is usually the responsibility of the applicant who is proposing changes to a specific wetland.

For further guidance on Step 1, Analyzing the Landscape and Its Wetlands, see Chapter 5 and Appendices 5-A through 5-C of this volume.

4.2.3 Step 2: Prescribing Solutions

Step 2 describes the processes by which local governments develop the solutions they propose to use to protect and manage wetlands within their jurisdiction. The goal of Step 2 is to identify means for incorporating the results of the landscape analysis in Step 1 into effective planning, regulatory, and non-regulatory tools.

This is the step in which Smart Growth planning approaches such as Green Infrastructure or Alternative Futures (discussed in Chapter 6) can be applied, and when comprehensive plans, critical areas ordinances, shoreline management plans, restoration plans, and incentives for conservation are typically developed.

Prescribing Solutions at the Scale of the Contributing Landscape

To develop solutions for a contributing landscape, which often extends outside the regulatory authority of a local jurisdiction, the jurisdiction will need to coordinate with other, contiguous governments. In reality, however, adjacent jurisdictions may not share the same values or priorities. The ability of a local jurisdiction to plan for geographic areas outside of its purview may, therefore, be limited. Only general guidance can be provided at this point.

For areas of the contributing landscape that fall within the management area, the process of prescribing solutions is the same as for the management area, as described below.

Prescribing Solutions at the Scale of the Management Area

Solutions for protecting and managing wetlands within the management area can be prescribed in many forms. Generally they include policies contained within comprehensive plans or community plans; codes (such as zoning) and ordinances (including those for critical areas and clearing and grading); stormwater management plans; shoreline master programs; and non-regulatory approaches such as preservation and restoration plans and incentives for conservation such as tax relief.

The approach to prescribing solutions proposed here is to plan for future development and the protection of wetlands by analyzing different alternative scenarios (called “Alternative Futures”) in terms of their impacts on wetlands and landscape processes. These scenarios should include both general planning approaches, such as different patterns of zoning, and more specific approaches, such as different widths of buffers for wetlands with different ratings. The local government usually incorporates other factors into the scenarios based on the priorities of citizens for their communities. (See Chapter 6 for further discussion.)

The effects of the different scenarios can be compared and evaluated to determine which solution might reduce or limit the impacts on landscape processes. Analyses of scenarios are an important way to summarize detailed scientific information, and they can be very helpful in decision-making.

This is also the step at which a jurisdiction should ensure consistency between various policies, plans, and regulations administered by the jurisdiction that may influence wetland resources. For example, a grading code may have to be modified to reflect considerations for wetlands or their buffers.

Prescribing Solutions at the Site Scale

Prescribing solutions at the site scale for local jurisdictions involves developing ways to protect wetlands that have been identified during the landscape analysis as requiring tailored protection that is different from the protection afforded to most other wetlands through critical areas regulations. These wetlands are often called “wetlands of local significance.” They may include wetlands with a high value for recreation, aesthetics,

potential for restoration, or potential as mitigation banks, or they may be crucial to supporting a landscape process such as aquifer recharge.

The solutions for protecting these wetlands can be specified in advance by using policies in the comprehensive plan or community plans, or even site-specific or wetland-type-specific regulatory language. For example, the City of Everett identified specific actions at individual wetlands in the mouth of the Snohomish River estuary that could be taken to restore landscape processes (City of Everett 1997). There was a high probability of success with an important increase in functions.

For guidance regarding tools for Step 2, Prescribing Solutions, see Chapters 6 through 9 of this volume.

Characterizing the Risk from Proposed Solutions

A characterization of risks should be used to evaluate the different solutions being suggested for managing and protecting wetlands (see Chapter 10). Such a characterization provides a way to develop, organize, and understand the decisions being made about future land uses. It also enables decision makers and the public to make more informed decisions about land uses and wetland resources. Solutions that cause a higher risk to the wetland resource because they are driven by other societal needs can be balanced by other solutions that reduce the risks (e.g., through restoration). Avoiding impacts and maintaining functions, however, is generally more cost effective and less risky (see Volume 1, Chapter 6 for further discussion).

4.2.4 Step 3: Taking Actions

Step 3 ensures that the solutions developed and adopted in Step 2 are effectively implemented through taking actions at the different geographic scales. Examples of taking actions include:

- Implementing regional, subarea, or community plans on the ground,
- Applying critical areas and clearing and grading ordinances at specific wetland sites when a development is proposed,
- Restoring or preserving wetlands identified in a restoration plan via a landscape analysis,
- Setting up a Public Benefit Rating System to provide tax relief for landowners with wetlands (see Chapter 9 for more information).

Taking Action at the Scale of the Contributing Landscape

Taking action at the scale of the contributing landscape requires adequate funding and coordination over time. Although the benefits can be great if the solutions are carried

out, the challenges are great as well. For example, of the three regional plans that have been developed to protect wetlands—the Everett Snohomish Estuary Wetland Integration Plan (SEWIP), the Mill Creek Special Area Management Plan (SAMP), and the Port of Skagit Wetland Industry Negotiations (WIN)—only one (Skagit WIN) was ever adopted and implemented.

Taking Action at the Scale of the Management Area

Taking action to implement plans, regulations, and non-regulatory approaches adopted by a jurisdiction for its management area is critical to protecting wetlands. The scientific literature reviewed for Volume 1 indicated that one of the major reasons why the functions and values of wetlands continue to be degraded is a lack of resources to implement and follow through on proposed solutions.

In the case of a critical areas ordinance for wetlands, an adequate number of staff is needed. The staff should be trained to review proposals and enforce the conditions placed on those proposals to ensure that wetlands are protected as planned. This holds true especially for compensatory mitigation; Chapter 6 of Volume 1 highlights the fact that many compensation projects designed to replace wetland functions lost through development have failed in part because of a lack of regulatory oversight and follow-through. Likewise, plans for restoration need staff to implement them, sources of funding secured, and sites restored on the ground.

Taking Action at the Site Scale

Taking action at a specific wetland involves applying the specific management measures identified for that site. As with taking action for the management area, implementation requires monitoring the compliance and effectiveness of compensatory mitigation or non-regulatory actions taken at individual sites.

For further discussion of Step 3, Taking Actions, see Chapter 11 of this volume.

4.2.5 Step 4: Monitoring

Monitoring at all three geographic scales (contributing landscape, management area, site) should be an integral part of a strategy to protect and manage wetlands. Monitoring should address the following central question: *Are the actions taken by a local jurisdiction effectively protecting or restoring the functions and values of the wetlands within its purview?*

Local jurisdictions cannot determine whether their solutions (developed in Step 2 and implemented in Step 3) are actually protecting wetlands without collecting data that monitor the success of their approach at the three geographic scales. Monitoring whether adequate protection has been achieved, followed by any needed corrective action, is especially critical because all the information collected to date, and reviewed in Volume 1, indicates that there is continued loss of wetlands and their functions and values.

Monitoring associated with assessing the protection and management of wetlands by local jurisdictions can be divided into three categories:

- **Monitoring trends** regarding changes in landscape processes and the level of performance of the functions provided by wetlands at the site scale;
- **Monitoring the actions taken to implement** the regulatory and non-regulatory solutions developed at all geographic scales;
- **Monitoring the effectiveness of actions taken to protect and manage wetlands** to determine how well the overall approach (including all solutions) is meeting the goals to protect and manage wetlands at all geographic scales.

If the functions and values of wetlands are not adequately protected, managers need to know whether this results from inadequate implementation, inadequate standards, or inadequate strategies. Therefore, all three aspects of monitoring are important in providing feedback to guide future decision-making.

For further discussion of Step 4, Monitoring, see Chapter 12 of this volume.

4.2.6 Adaptive Management

Adaptive management—the “feedback loop”—is based on a review of the information collected through the monitoring step and a determination of what changes are necessary to improve protection when goals are not met so that future management, policies, and regulations are more effective in protecting the wetland resource (Washington State Joint Natural Resources Cabinet 1999). Scientists agree that some of the continued degradation of the functions and values of natural systems such as wetlands is a result of a lack of monitoring and adaptive management (Dale et al. 2000). This aspect of managing and protecting wetlands is therefore vital to successfully protecting wetlands over time.

The key element of adaptive management is a commitment to periodically revisit the four steps in the framework described earlier. Monitoring should provide new data and information that feed into Step 1 (Analyzing the Landscape and Its Wetlands). As the data are analyzed, new information can be generated that may require changing the solutions prescribed (Step 2) and the actions that need to be taken (Step 3). The effectiveness of the new solutions and actions then also needs to be monitored (Step 4) and the cycle repeated over time.

For further discussion of Adaptive Management, see Chapter 12 of this volume.